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Body and local factors affecting eruption of third molar tooth

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Abstract

Aim : The aim of this study was to evaluate the correlation of some local and body factors with third molar eruption and may cause delay eruption or impaction which represents one of most important problem in dental clinic.

Method: 150 dental students volunteers participated in this study from both genders and aged between 18-27 years old. A clinical oral examination, body parameters measurements in addition to past dental history were used to assess certain parameters.

Results and conclusions: among all the investigated body and local factors ; only age and body height were significantly affected the eruption of third molar tooth ($P<0.05$).

Keywords: BMI: Body mass index

Introduction

Tooth eruption is a normal physiological process that is affected by different systemic and local factors. Eruption begins by the movement of the tooth from its site of development in the alveolar bone to the occlusal plane in the oral cavity. The tooth eruption is a complex regulated process which divided into 5 stages; pre-eruptive movement , intra-osseous stage ,mucosal penetration ,pre-occlusal and post-occlusal stages[1]. Active tooth eruption begins when osteoclasts made their pathway in the alveolar bone which is called the gubernacular canal and located above each tooth; i.e. bone resorption widens the canal to allow the crown to move through it and exits the alveolar bone [2]. An impacted tooth is one that fails to erupt into the dental arch within the specific time. Teeth may become impacted because of adjacent teeth, dense overlying bone, excessive overlying soft tissue or a genetic abnormality. Most often, the cause of impaction is inadequate arch length and space in which to erupt [3]. That is mean the total length of the alveolar arch is smaller than the tooth arch. Third molar tooth was one of the most common permanent teeth that affected by these factors more than other teeth which may lead to its impaction [4]. Because impacted teeth do not erupt, they are retained throughout the individual's lifetime unless extracted or exposed surgically. Third molars are frequently impacted because they are the last teeth to erupt in the oral cavity. Mandibular third molars are more commonly impacted than their maxillary counterparts [3].

Third molars teeth are the final set of molars that most people get in their late teens or early twenties, for most

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people (usually ages 18 to 24 years), although eruption outside of this age range is not uncommon. Sometimes these teeth can be a valuable asset to the mouth when healthy and properly aligned, but more often, they are misaligned and require removal [5].

When third molar teeth are misaligned, they may position themselves horizontally, be angled toward or away from the second molars, or be angled inward or outward. Poor alignment of third molar teeth can crowd or damage adjacent teeth, the jawbone, or nerves [6].

Impaction of third molar tooth represents a major problem in oral practice specially surgical and orthodontic field. A few studies had been done to conduct the factors that affect the eruption of third molar tooth. Body weight, length and body weight mass (BWM) may have a correlation with tooth impaction through its relationship with bone/tooth size. Considering environmental, genetic. Disproportion of tooth, jaw/arch size could be predisposing factors to impaction. This study was conducted to evaluate the effect of physical measurements and local factors that could be contribute to the occurrence of third molar impaction.

Materials and Methods

The study included Iraqi dental students from both genders who were at least 18 years old. A total of 150 volunteers participated in this study. 57 (38%) male and 93(62%) female. The study performed in Oral pathology department/ College of Dentistry –Al-Mustansiria University between November –December/2014.

A clinical examination with past dental history and certain physical measurements (body parameters) had been done to evaluate certain factors effect on the eruption of third molar; these factors include:

a- Physical body properties, these includes:

1. Age
2. Weight (in Kilograms)
3. Length (in centimeters)
4. Body mass index

b- Local factors, these includes:

1. Number of extracted teeth.
2. Number of missing teeth.
3. Number of third molar.
4. History of surgical removal of third molar
5. Teeth alignment or (crowding).
6. History of orthodontic treatment

Body mass index (BMI) was determined by measuring body weight (BW) and body height (BH) of each subject, then dividing the weight of the body on square of height in meters. All the parameters were investigated in relation to the third molar teeth condition which subdivided into 5 groups as follow:

1- No third molar tooth=0
2- One tooth erupted=1
3- Two teeth erupted=2
4- Three teeth erupted=3
5- Four teeth erupted=4

Statistical analysis:

Descriptive statistics (mean , standard deviation, standard error) were calculated for each body variable(age ,weight ,length ,body mass) and local factors variable (number of third molar teeth, extracted teeth ,missing teeth, in addition to crowding, history of orthodontic treatment and surgical removal of third molar tooth). The data were analyzed by using statistical package of the SPSS version 14. Paired sample t-test was used to compare differences between groups (p=0.05, CI 95% and p=0.01 and CI 99%). Pearson's correlation coefficient for discrete variable comparison was used to

measure significance of correlation. ANOVA test also were used to assess the differences between the groups and within groups. Tukey test is used for multiple comparisons.

Results

1. **Age:**
   The mean of age, standard deviation and standard errors for each third molar tooth subgroups are seen in table (1). While for all groups are seen in table (2). The paired sample t- test and correlation are seen in table (3). There were significant correlation between age and third molar eruption. According to ANOVA test there was significant correlation between age and eruption between groups and within the groups table (4). While in multiple comparisons ; there was significant correlations between (2,4) third molar tooth groups in 0 and 1groups and (1,2) in 2 and 4 groups as seen in table (5).
2. **Length:**
   The mean of length , standard deviation and standard errors for each third molar tooth subgroups are seen in table (1). While for all groups are seen in table (2). The paired sample t- test and correlation are seen in table (3). There were significant correlation between length and third molar eruption. According to ANOVA test there was significant correlation between length and eruption between groups and within the groups table (4). While in multiple comparisons; there was significant correlations between 1and 4 third molar tooth groups as in table (5).
3. **Weight:**
   The mean of weight, standard deviation and standard errors for each third molar tooth subgroups are seen in table (1). While for all groups are seen in table (2). The paired sample t- test and correlation are seen in table (3). There were no significant correlation between weight and third molar eruption.
4. **Body-mass:**
   The mean of bodymass, standard deviation and standard errors for each third molar tooth subgroups are seen in table (1). While for all groups are seen in table (2). The paired sample t- test and correlation are seen in table (3). There were no significant correlation between bodymass and third molar eruption.
5. **Extracted teeth number:**
   The mean of number of extracted teeth, standard deviation and standard errors for each third molar tooth subgroups are seen in table (1). While for all groups are seen in table (2). The paired sample t- test and correlation are seen in table (3). There were no significant correlation between number of extracted teeth and third molar eruption.
6. **Number of missing teeth:**
   The mean of number of missing teeth ,standard deviation and standard errors for each third molar tooth subgroups are seen in table (1). While for all groups are seen in table (2). The paired sample t- test and correlation are seen in table (3). There were no significant correlation between number of missing teeth and third molar eruption.
7. **Presence or absence of teeth crowding:**
   The state of teeth alinement mean, standard deviation and standard

errors for each third molar tooth subgroups are seen in table (1). While for all groups are seen in table (2). The paired sample t- test and correlation are seen in table (3). There were no significant correlation between crowding of the teeth and third molar eruption.

8. **History of orthodontic treatment:**
   The presence of a history for orthodontic treatment (completed or not) mean, standard deviation and standard errors for each third molar tooth subgroups are seen in table (1). While for all groups are seen in table (2). The paired sample t- test and correlation are seen in table (3). There were no significant correlation between the application of orthodontic treatment and third molar eruption.
9. **History of surgical treatment:**
   The `need for surgical removal or extraction of third molar mean , standard deviation and standard errors for each third molar tooth subgroups are seen in table (1). While for all groups are seen in table (2). The paired sample t- test and correlation are seen in table (3). There was no significant correlation between the `need for surgical removal or extraction of third molar and it's eruption.

Discussion

The predictability index of third molar eruption is an important tool useful not only for determination of probable occurrence of impaction but also prevention of the associated pre and post eruption problems through proper counsel, careful evaluation and suitable intervention.

In this study, the occurrence of third molar eruption was assessed by clinical variables that include physical body factors (age, eight, height and body mass index).While local factors were (number of third molar erupted, missing and extracted teeth, presence or absence of crowding; in addition to past orthodontic and surgical treatment).

These factors are invariably determined by the differential and complex effects of the relationship of both genetic and environmental on the pattern and direction of growth and development of whole skull [7,8,9].Among the factors that have been standard to contribute to the third molar eruption/impaction; are the growth of both teeth and jaw, tooth development, the direction of eruption, and the direction of growth of both teeth and jaw [10,11].

While direction of growth and eruption may not be easily assessed objectively, the extent of growth of the jaws/alveolar arch and signs of the teeth can be evaluated.

Many authors have emphasized that third molar eruption associated with insufficient growth of the jaws [9,10]. They documented arch length as the single most important factors in the determination of third molar eruption.

This view is not consistent with the findings of this study, in which jaw growth has been found not to contribute significantly to the third molar eruption.

There was no significant correlation between teeth alignment (crowding) and impaction of the third molar. Also; the amount of space in the arch between the teeth was invaluable in expecting the eruption of the teeth into the proper position of functional occlusion [8,9].

The summation of the predictive effect of both contribution variables was also not significant when compared with other variables used in this study. Contribution to eruption, weight (which is reflection of the

muscle and bone mass), height (a reflection of stature /appendicular and axial length) and body mass index (a measure of body fat) as stated by [12]. It was found that the height is the only physical body factors that correlates significantly to the occurrence of impaction in an individual.

It was observed in this study that there is no possibility of impaction when crowding occurs in the spacing in the anterior segment of the alveolar arch.

Crowding occurs in the absent spacing in the alveolar arch. In other words; the occurrence of impaction is not necessarily dependent on the dimensions of the anterior or posterior segments of the arch and the total dimensions of the anterior / posterior segments of the arch and the signs of each tooth in the arch [13].

When assessing the individual anterior-posterior dimension (length) one may expect that with a larger ramus width, the arch length may be too short to accommodate the eruption of third molars [14,15,16].Age, was a significant factor which correlate with rate of occurrence of impaction which indicates that impaction could be a matter of time.

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Table (1): Mean, standard deviation, standard errors for all 3ed molar subgroup

parameters	subgroups	mean	Std.Deviation	Std.Error	Minimum	Maximum
age	.00	19.8	1.21	.15	18	23
	1	19.39	.92	.22	18	21
	2	21.17	1.44	.29	18	23
	3	21.2	1.15	.48	20	23
	4	20.9	1.71	.26	18	27
Length	.00	163.9	8.89	1.12	150	187
	1	160.28	6.54	1.54	150	177
	2	166.26	13.37	2.79	130	190
	3	167.2	11.65	5.21	153	179
	4	168.11	7.88	1.23	154	184
Weight	.00	61.33	12.42	1.56	40	113
	1	59.22	7.9	1.86	48	80
	2	61.74	12.12	2.52	37	91
	3	68.4	6.84	3.11	60	75
	4	64.37	10.14	1.57	46	88
bodymass	.00	22.11	3.63	.45	2.82	28
	1	22.9	2.99	.71	18.75	31.25
	2	22.38	4.04	.84	16.13	35.5
	3	24.85	4.82	2.16	19.69	30.36
	4	22.5	2.55	.4	17.9	29.04
Extracted	.00	.33	.80	.02	.00	4.00
	1	.61	.91	.00	.00	3.00
	2	.35	.48	.04	.00	1.00
	3	.20	.45	.00	.00	1.00
	4	.29	.75	.00	.00	4.00
missing	.00	.11	.12	.02	.00	1.00
	1	.00	.00	.00	.00	0.00
	2	.04	.2	.04	.00	1.00
	3	.00	.00	.00	.00	0.00
	4	.01	.00	.00	.00	0.00
crowding	.00	.68	.47	.11	.00	1.00
	1	.61	.50	.12	.00	1.00
	2	.78	.42	.11	.00	1.00
	3	.1	.00	.00	.10	1.00
	4	.78	.42	.11	.00	1.00
ortho	.00	.11	.31	.04	.00	.00
	1	.16	.38	.10	.00	1.00
	2	.04	.20	.04	.00	1.00
	3	.00	.00	.00	.00	2.00
	4	.11	.30	.05	.00	3.00
surgery	.00	.00	.00	.00	.00	.00
	1	.06	.24	.06	.00	1.00
	2	.09	.29	.06	.00	1.00
	3	.40	.89	.40	.00	2.00
	4	.11	.49	.11	.00	3.00

Table (2): Mean, standard deviation ,standard errors for all groups

Std. error mean	Standard deviation	mean	parameters
.12	1.51	20.31	**Age**
.77	9.52	165.11	**Length**
.91	11.19	62.21	**Weight**
.28	3.4	22.43	**Body mass**
.06	.75	.35	**Extraction**
.01	.12	.01	**Missing**
.037	.45	.73	**Crowding**
.029	.29	.09	**Ortho treatment**
.027	.33	.06	**Surgical treatment**

Table (3): Paired t-test

Sig.	correlation	Sig(2-tailed)	df	t	Std. error mean	Std. deviation	mean	Variable pairs
.00	.35	.00	149	126.42	.15	1.81	18.69	**Age-3ed molar**
.01	.21	.00	149	214.81	.76	9.32	63.47	**Length-3ed molar**
.10	.13	.00	149	66.88	.91	11.11	60.59	**Weight-3ed molar**
.42	.07	.00	149	-69.1	.15	1.86	1.27	**bodymass**
.61	-.04	.00	149	8.32	.14	1.68	1.61	**Extracted-3ed molar**
.6	-.04	.00	149	11.7	.18	1.68	.89	**Missing-3ed molar**
.14	.12	.00	149	6.51	.14	1.68	1.52	**Crowding-3ed molar**
.78	-.02	.00	149	11.96	.13	1.66	1.56	**Ortho-3ed molar**
.07	.15	1.00	149	11.53	.30	3.69	20.81	**Surgery-3ed molar**

Table (4): ANOVA test

Sig.	F	Mean square	Sum of squares		Parameters
.00	8.99	16.89 1.88	67.58 272.31 339.89	Between groups Within groups total	**Age**
.034	2.679	232.497 86.77	929.99 2581.88 3511.87	Between groups Within groups Total	**Length**
.32	1.196	149.11 124.636	596.34 8072.26 8668.59	Between groups Within groups total	**Weight**
.48	.88	10.15 11.59	40.62 1681.42 1722.04	Between groups Within groups total	**Bodymass**
.63	.653	.373 .571	1.5 82.78 84.27	Between groups Within groups total	**Extracted**
.66	.611	.01 .01	.033 1.94 1.97	Between groups Within groups total	**Missing**
.33	1.165	.23 .2	.92 28.86 29.79	Between groups Within groups total	**Crowding**
.68	.576	.05 .1	.198 12.5 12.7	Between groups Within groups total	**Ortho**
.09	2.04	.22 .11	.88 15.58 16.46	Between groups Within groups total	**surgery**

Table (5): Tukey HSD test for multiple comparisons

Tukey HSD

Dependent Variabl	(I) wisdom	(J) wisdom	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
age	.00	1.00	.40476	.36625	.804	-.6070	1.4165
		2.00	-1.38026*	.33386	.001	-2.3025	-.4580
		3.00	-1.40635	.63672	.182	-3.1652	.3525
		4.00	-1.10879*	.27498	.001	-1.8684	-.3492
	1.00	.00	-.40476	.36625	.804	-1.4165	.6070
		2.00	-1.78502*	.43126	.001	-2.9763	-.5937
		3.00	-1.81111	.69277	.073	-3.7248	.1026
		4.00	-1.51355*	.38748	.001	-2.5839	-.4432
	2.00	.00	1.38026*	.33386	.001	.4580	2.3025
		1.00	1.78502*	.43126	.001	.5937	2.9763
		3.00	-.02609	.67620	1.000	-1.8940	1.8419
		4.00	.27147	.35701	.941	-.7147	1.2577
	3.00	.00	1.40635	.63672	.182	-.3525	3.1652
		1.00	1.81111	.69277	.073	-.1026	3.7248
		2.00	.02609	.67620	1.000	-1.8419	1.8940
		4.00	.29756	.64916	.991	-1.4957	2.0908
	4.00	.00	1.10879*	.27498	.001	.3492	1.8684
		1.00	1.51355*	.38748	.001	.4432	2.5839
		2.00	-.27147	.35701	.941	-1.2577	.7147
		3.00	-.29756	.64916	.991	-2.0908	1.4957
cm	.00	1.00	3.62698	2.48957	.592	-3.2502	10.5042
		2.00	-2.35611	2.26936	.837	-8.6250	3.9128
		3.00	-3.29524	4.32801	.941	-15.2510	8.6605
		4.00	-4.19280	1.86915	.170	-9.3561	.9705
	1.00	.00	-3.62698	2.48957	.592	-10.5042	3.2502
		2.00	-5.98309	2.93144	.252	-14.0809	2.1147
		3.00	-6.92222	4.70903	.584	-19.9305	6.0860
		4.00	-7.81978*	2.63382	.028	-15.0955	-.5441
	2.00	.00	2.35611	2.26936	.837	-3.9128	8.6250
		1.00	5.98309	2.93144	.252	-2.1147	14.0809
		3.00	-.93913	4.59641	1.000	-13.6363	11.7580
		4.00	-1.83669	2.42674	.942	-8.5403	4.8669
	3.00	.00	3.29524	4.32801	.941	-8.6605	15.2510
		1.00	6.92222	4.70903	.584	-6.0860	19.9305
		2.00	.93913	4.59641	1.000	-11.7580	13.6363
		4.00	-.89756	4.41256	1.000	-13.0868	11.2917
	4.00	.00	4.19280	1.86915	.170	-.9705	9.3561
		1.00	7.81978*	2.63382	.028	.5441	15.0955
		2.00	1.83669	2.42674	.942	-4.8669	8.5403
		3.00	.89756	4.41256	1.000	-11.2917	13.0868

*. The mean difference is significant at the .05 level.